

NASA Kentucky Space Grant Consortium  
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### PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The **NASA Kentucky Space Grant Consortium** is a Designated Consortium funded at a level of **\$845,000** for fiscal year 2010.

### PROGRAM GOALS

The **NASA Kentucky Space Grant** goals are to serve the needs and emphases of NASA's National Space Grant College and Fellowship Program while serving the specific needs of the Commonwealth of Kentucky, through a program that enhances capabilities for aeronautics- and space-related research and education in Kentucky, and develops future workforce for NASA, Kentucky, and the Nation.

**Objectives:** The NASA and Kentucky Space Grant objectives are: to promote a strong STEM education base by preparing students and teachers; to maintain a network of universities contributing to aeronautics and space; to encourage collaborations among universities, aerospace industry, and government; to support aerospace training, research and public outreach; and to recruit and train U.S. citizens, especially women, minorities and disabled persons. Kentucky Strategic Themes and Kentucky Emphases compliment NASA Educational Outcome Objectives and NASA Emphases while guiding definition of the 2010-2014 KSGC programs.

**NKSG Strategic Theme #1: Pathways of Opportunities** – Programs will build on Kentucky's space science specialization, start immediately and span the full five years of the plan to: 1) Provide integrated progressions of opportunities for STEM workforce development to meet NASA priorities, 2) Mirror NASA's Education Framework to Inspire, Engage, Educate, Employ, 3) Incorporate recognized local scientific sites (planetaria and observatories) as statewide outposts for teacher training, student internships, diversity engagement and KSGC Affiliate leadership and involvement, 4) Be a catalyst for higher education recruitment, and 5) Enhance in-state employment in Kentucky's aerospace industry.

***NKSG Strategic Theme #2: NextGen Partnerships*** - Programs will be developed early in the 5-year cycle then phased-in to provide: 1) A new in-state aerospace engineering degree option, 2) An emphasis on aeronautics R&D, 3) New links to the Kentucky Community and Technical College System (KCTCS), and 4) A new high-school-to-higher-education pathway combining aviation and aerospace inspiration supporting NASA's NextGen Air Transport initiative.

## **PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, OR 3)**

**Undergraduate Scholarship (Outcome 1):** Ms. Schuyler Wolff, an undergraduate Physics & Astronomy student at Western Kentucky University, traveled to Kitt Peak National Observatory and California Institute of Technology Palomar Observatory to obtain critical data for her undergraduate thesis on Type Ia Supernova. In addition to collaborating with scientists at the observatories, she presented her work at two national meetings and has been accepted into several prestigious graduate programs.

**Graduate Fellowship (Outcome 1):** Mr. Harry Russell is completing his Masters in Engineering at the University of Louisville and will continue as a PhD student in Chemical Engineering. His research on hematite nanowires arrays for energy conversion includes collaborations with the Chief Scientist for Space Exploration at NASA Ames Research Center and is published in three journal papers.

**Student Team Project (Outcome 1):** In 2010, female engineering students from Western Kentucky University distinguished themselves at the Lunabotics Competition. Three of the ME students who participated in 2010 are now seniors and comprise the core of the 2011 WKU ARTEMIS Double Prime team, practicing systems engineering and spiral design as they focus on improving less-reliable technologies from the previous year. These students are female role models in STEM education, winning the section presentation award at the recent WKU Student Research Conference and conducting outreach programs for high school students.

## **PROGRAM ACCOMPLISHMENTS**

SMART Objectives (5-year goals)

### **Year 1 Progress**

NASA Kentucky Space Grant Programs were proposed following NASA's Educational Framework. Results are reported herein for each program under the three educational outcomes. SMART Objectives are listed from the proposal in un-bold type, followed by the Year-1 Progress toward each goal in bold. These include 5-year combined targets for normalized measures such as competitiveness, return-on-investment (RoI) and diversity percentages, as well as 1-year totals for award and participant counts. Brief comments on each objective follow the summarized results.

Note that this is the first year that the NASA Kentucky Space Grant was hosted at the University of Kentucky (UK). A "Transition Award" bridged programs supported by the

prior host institution (Western Kentucky University, WKU) and those of the Year-1 NASA Kentucky Space Grant. Bridge Programs included Summer 2010 Student Interns, Summer 2010 Student and Faculty Workshop Travel, Fall 2010 Graduate Fellows and Undergraduate Scholars, a Student Spaceflight Experiments Program (SSEP) team, and development of an aircraft design competition for statewide aviation programs. Transition results are included when they would not have been previously reported and are indicated as “Transition.”

### Outcome 1 - Higher Education

Diversity (10.8% minority, 50% women; targeted recruiting mini-grants 3 + 1 HBCU)

**Year 1 Progress: 15.4% minority, 25% women; 2 Kentucky Girls STEM Collaborative Mini Grants, 0 HBCU**

Year-1 results met the minority target, but fell short of the %-women and award-count targets. Diversity percentage targets in the proposal were based on jurisdictional population statistics (10.8% minority and 50% female). Of 52 proposals received for SG (42) and Transition (10) programs, key participants (PI, Co-PI or students, totaling approx 93 people) on 8 proposals were minority (15.4% of proposals) and on 13 proposals were female (25% of proposals). These results are based on submitted proposals as a representation of research capacity that can be observed and compared over the 5-year period. Year-2 efforts will focus on increasing the targeted recruiting award counts so that five-year goals will be met. Year-2 efforts will also evaluate the appropriateness of a population-based target for female participation when STEM female population statistics for students and faculty range from 10-15% and 5-10%, respectively. The five-year percentage target for women may be adjusted after Year-2 to represent a “stretch goal” from the STEM populations rather than based on the general population.

Graduate Fellowships (5 LT Fellows, Competitiveness 1:3, Publications/Presentations 1/Fellow)

**Year 1 Progress: 11 LT Fellows (7 Transition), Competitiveness 4:7, Pub/Pres 1/Fellow**

Student count target met for Graduate Fellowships. Baseline competitiveness was established; Year-2 efforts will focus on increasing the number of submitted proposals. Poster presentations at the combined May 2011 Innovation/Kentucky EPSCoR Conference are required for all SG Fellows.

Undergraduate Scholarships (10 LT Scholars, 3 HE Institutions, Competitiveness 1:2, 3 HBCU applications, 20 participants, 1 team project, 10 travel, 15 contacts with NASA)

**Year 1 Progress: 23 LT Scholars, 3 HE Inst., Competitiveness 23:58 (Undergraduate Scholarships 3:3, Team Projects 3:3, Summer Interns 10:45, Transition 7:7), 0 HBCU, 61 Participants (7 Transition), 16 Travel (6 Transition), 28 contacts with NASA (7 Transition)**

All targets met for Undergraduate Scholarships.

Research Initiation Awards (3 LT students, Competitiveness 1:3, 6 awards, Publications/Presentations 2/award, follow-on proposals \$3:\$1)

**Year 1 Progress: 3 LT Students, Competitiveness 8:13, 8 awards, Pub/Pres 1/award, Follow-on Proposals N/A**

Baseline competitiveness was established; Year-2 efforts will focus on increasing the number of submitted proposals. Kentucky EPSCoR Reporting System (KERS) results not available for pub/pres and follow-on funding results (KERS reporting is annually during the summer). Follow-on funding measure will be available in Year-2.

Kentucky Space (6 LT students, 4 HE Institutions, 3 year return on investment \$1:\$1)

**Year 1 Progress: 8 LT students, 6 HE Inst., 3 year Return-on-Investment (RoI) N/A**

Student and institution count targets met. Kentucky EPSCoR Reporting System (KERS) results not available for follow-on funding results (KERS reporting is annually during the summer). Follow-on funding measure will be available in Years 3-5.

NextGen Partnerships (4 industry partnerships established)

**Year 1 Progress: 4 Industry Partnerships initiated**

Target met for establishing NextGen Industry Partnerships. Kentucky Institute for Aerospace Education non-profit organization partnership has UK College of Engineering Memorandum of Understanding (MoU) in process. Visits to/from GE Aircraft Engines, Sofcoast (UAV systems) and RJ Corman Aviation Group established relationships for aerospace engineering curriculum development (GE) and Kentucky student summer industry internships.

Curriculum Development (1 course developed/revised)

**Year 1 Progress: 3 Courses developed/revised (1 Transition)**

Target met for Course Development.

### Outcome 2 - Precollege Education

Outposts (Identify 6 Outposts, sponsor 2 fieldtrips or short PD per outpost)

**Year 1 Progress: 0 Outposts**

Outposts programs not implemented during transition. NASA KY offices not available to assemble and distribute promotional materials. Year-2 plan to initiate Outpost relationships and conduct Outpost events.

Mini-Grants (4 HE Institutions, 6 awards in addition to 4 diversity awards above, 7000 Primary/Secondary participants)

**Year 1 Progress: 6 Mini-Grants awards, 6 HE Inst., 1750 P/S participants**

Targets met for awards and institutions. P/S participants include 500 Engineering Open House, 560 The Academy@Shawnee, 500 Sweet 16 Boys Basketball Tournament Artifact Display, 10 Engineering Alumni Recruiting Night Artifact Display, 180 KIAE network students curriculum and design competition. Participants target not met, but participants not fully accounted for due need for new P/S participant reporting process with new host institution. Year-2 efforts will include definition of P/S Participant reporting process.

NextGen Partnerships (Director attend Kentucky Aviation Academy PD)

**Year 1 Progress: Assoc. Director attended Kentucky Aviation Academy June 2010**

### Outcome 3 - Informal Education

Artifacts & Models (Display 3 unique-to-KY artifacts)

**Year 1 Progress: 4 Exhibits**

Target met, including BIG BLUE II Mars Airplane at E-Day Feb 2011, CubeSat and CubeLab hardware and display at SSEP launch reception at Academy@Shawnee Apr 2011, UK Design/Build/Fly Aircraft at Kentucky High School Athletics Association Sweet-16 Basketball Tournament as part of FutureLab Mar 2011, and UK Design/Build/Fly Aircraft at UK Engineering Alumni Reception Mar 2011.

Distribute Materials (Distribute NASA/KSGC materials to 30 sites)

**Year 1 Progress: 30 sites provided program information**

Target met. Materials provided to 12 KIAE, to 12 NASA Kentucky SG affiliates, with 4 artifact displays, for Jessamine County Public Library “Science Fiction to Science Fact” Discussion night and 1 other.

Informal Education Partnerships (Informal Educators attending annual meeting)

**Year 1 Progress: Fall 2010 meeting postponed until completion of NASA KY offices (expected April 2011).**

Year-2 plan to include informal educators attending NASA Kentucky SG meeting.

## PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: Total awards = 35 (Transition Awards = 16 of 35); Fellowship/Scholarship = 9; Higher Education/Research Infrastructure = 10; 5 of the total awards represent underrepresented minority F/S funding. Number of students accepting STEM positions in an aerospace industry is not available, while 2 students have graduated and are pursuing advanced STEM degrees.

- Course Development: 3
- Matching Funds: 1:1 for all non-F/S, as required
- Minority-Serving Institutions: 2 (1 inactive consortium affiliate; 1 Challenger Center located at Shawnee High School)

Kentucky State University is the HBCU in the jurisdiction. The KSU affiliate representative attended the May 2010 meeting and the NASA Kentucky Associate Director contacted faculty at KSU, but no proposals were submitted to the SG programs offered and no students/faculty participated in Summer 2010 opportunities.

The Academy@Shawnee High School in Louisville, KY is actively involved in KIAE and KyDBF, developed a microbiology payload for SSEP and has opened a new Challenger Learning Center for Space Exploration. Shawnee serves 560 urban students with 63% minority and 86% free or reduced lunch enrollment. The NASA Kentucky Assoc Director attended the Center grand opening ceremony. In Year-2, all three Challenger Centers in Kentucky will be recruited as NASA Kentucky SG affiliates.

## IMPROVEMENTS MADE IN THE PAST YEAR

The Lead Institution transition from WKU to UK is continuing per the transition plan developed with SG Program Guidance in Feb-Mar 2010. Management of jurisdiction awards prior to April 2010 continue under PI Dr. Michael Carini at Western Kentucky University. Leadership of the consortium and management of jurisdiction awards after April 2010 are under Director Dr. Suzanne Smith and Associate Director Dr. Janet Lumpp at the University of Kentucky.

Office renovations in the UK Robotics Building, centrally located on UK campus, are nearly complete. An opening event is planned for September 2011. A new website is available at [nasa.engr.uky.edu](http://nasa.engr.uky.edu) and electronic proposal submissions via email have been implemented. Affiliate Representatives met twice in 2010 at the annual Kentucky EPSCoR Meeting (May) and for a proposal selection session (November). Teleconference calls have been used to conduct bimonthly meetings of the consortium.

Drs. Smith and Lumpp are members of the Advisory Committee tasked with updating Kentucky's Science & Technology Strategic Plan.

Dr. Smith is leading the efforts to develop a new Aerospace Engineering degree program at the University of Kentucky, with assistance from Dean Thomas Lester. The UK strategic plan includes development of the new degree program by 2015.

## PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

Bellarmino	University Private, Parochial University
Centre College	Private College
Eastern Kentucky University	Public Comprehensive University
Kentucky Science and Technology Corp.	Non-profit Organization
Kentucky State University	Public Comprehensive University, HBCU
Morehead State University	Public Comprehensive University
Murray State University	Public Comprehensive University
Northern Kentucky University	Public Comprehensive University
Thomas More College	Private, Parochial College
Transylvania University	Private University
Tribo Flow Separations, LLC	Industry
University of Kentucky	Public Doctoral Granting University
University of Louisville	Public Doctoral Granting University
Western Kentucky University	Public Comprehensive University

Affiliate Representatives distribute Requests for Proposals, encourage proposal submissions, promote partnerships with NASA, participate in proposal review cycles and develop program policies such as by-laws. Additional affiliates will be added once a by-laws mechanism is in place for applying and approving affiliates and representatives.